20 * FOOD AND KINDRED PRODUCTS

21 TOBACCO PRODUCTS

22 TEXTILE MILL PRODUCTS

23 APPAREL AND OTHER TEXTILE PRODUCTS

24 LUMBER AND WOOD PRODUCTS

25 FURNITURE AND FIXTURES

26 PAPER AND ALLIED PRODUCTS

27 PRINTING AND PUBLISHING

28 CHEMICALS AND ALLIED PRODUCTS

29 PETROLEUM AND COAL PRODUCTS

30 RUBBER AND MISC. PLASTICS PRODUCTS

31 LEATHER AND LEATHER PRODUCTS

32 STONE, CLAY, AND GLASS PRODUCTS

33 PRIMARY METAL INDUSTRIES

34 FABRICATED METAL PRODUCTS

35 INDUSTRIAL MACHINERY AND EQUIPMENT

36 ELECTRONIC & OTHER ELECTRIC EQUIPMENT

37 TRANSPORTATION EQUIPMENT

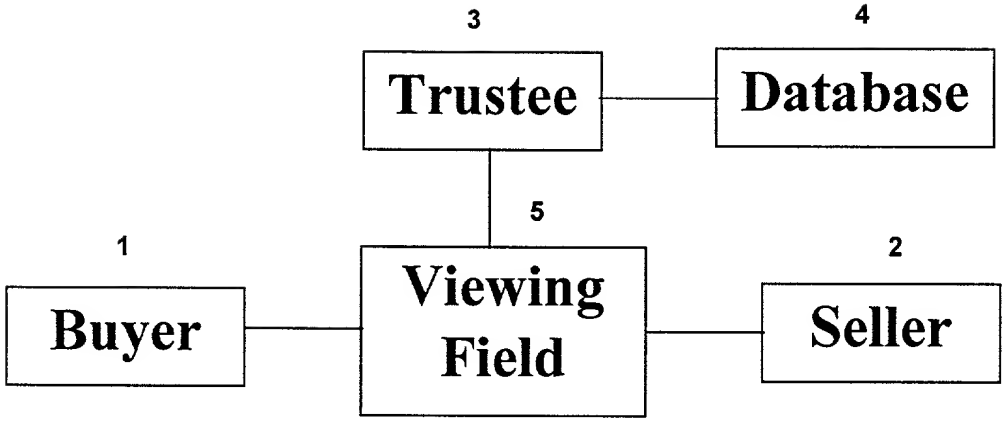
38 INSTRUMENTS AND RELATED PRODUCTS

39 MISCELLANEOUS MANUFACTURING INDUSTRIES

(* The numbers ahead of the industries indicate the SIC code)

FIG. 1

FIG. 2a



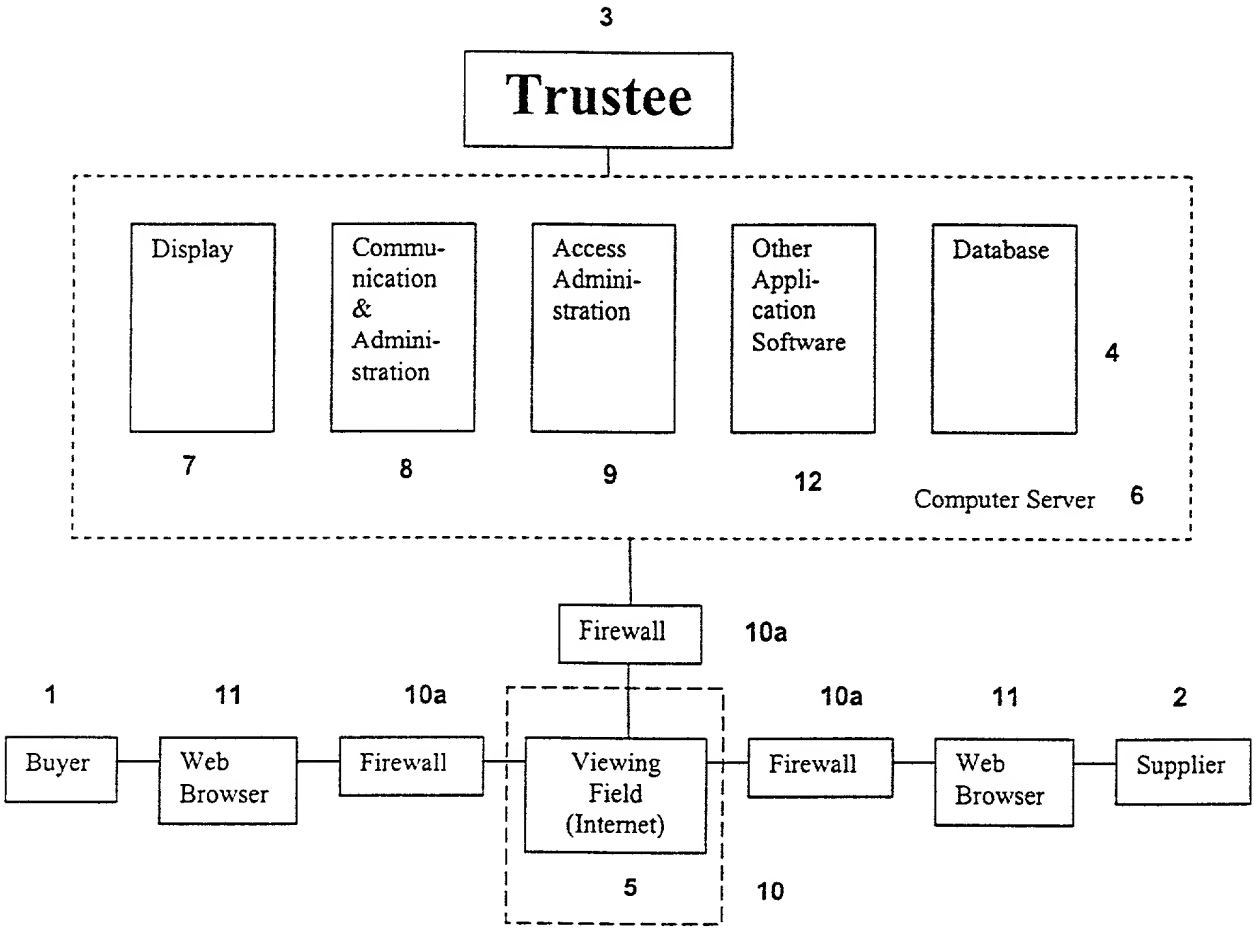
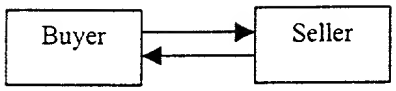

3
Trustee
Display
Commu-
nication
&
Admini-
stration
Access
Admini-
stration
Other
Appli-
cation
Software
Database
4
7
8
9
12
Computer Server
6
Firewall
10a
1
11
10a
10a
11
2
Buyer
Web
Browser
Firewall
Viewing
Field
(Internet)
Firewall
Web
Browser
Supplier
5
10

FIG. 2b

FIG. 2c



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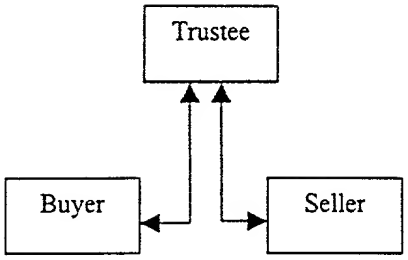
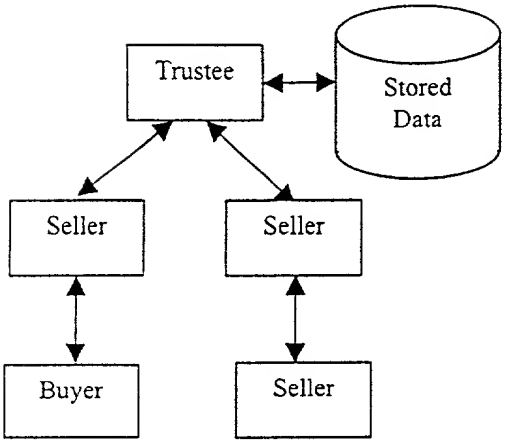


14



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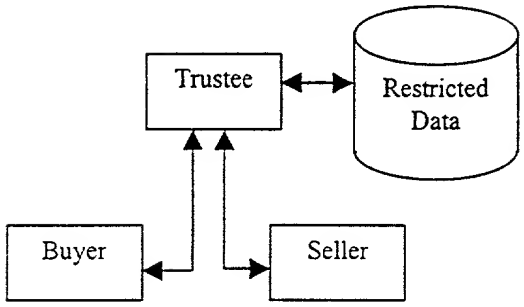

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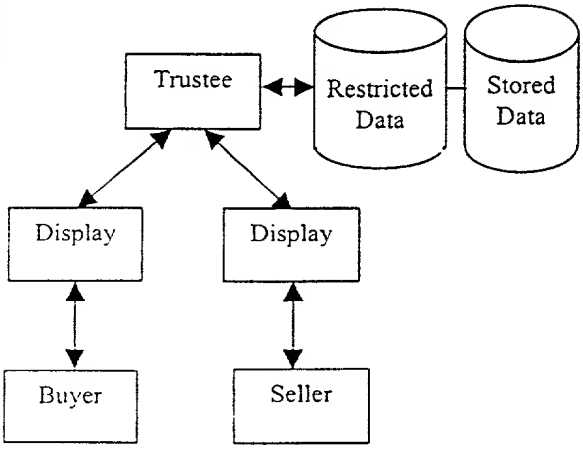

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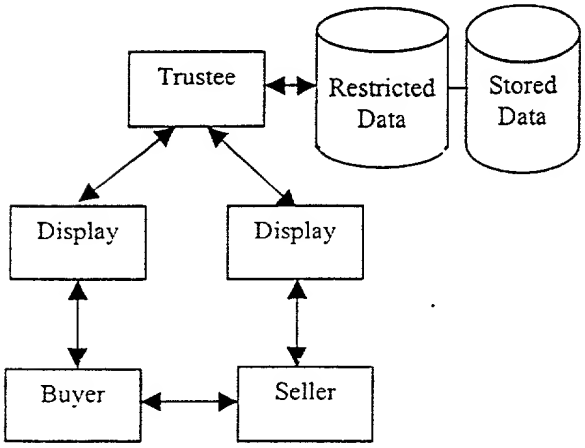

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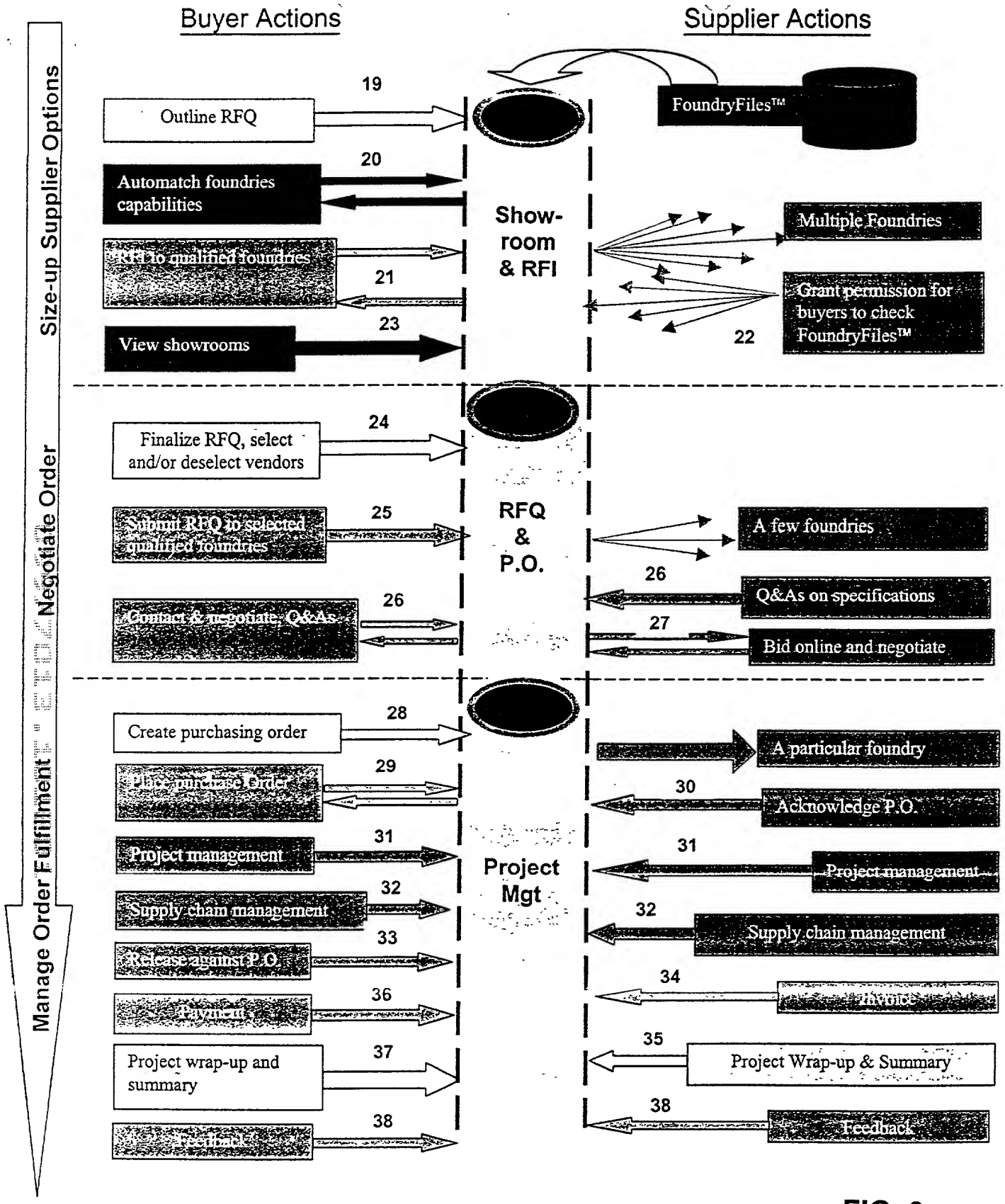

Buyer Actions
Supplier Actions
Size-up Supplier Options
Negotiate Order
Manage Order Fulfillment
19
Outline RFQ
FoundryFiles™
20
Automatch foundries capabilities
Show-room & RFI
Multiple Foundries
RFQ to qualified foundries
21
Grant permission for buyers to check FoundryFiles™
22
23
View showrooms
24
Finalize RFQ, select and/or deselect vendors
RFQ & P.O.
25
Submit RFQ to selected qualified foundries
A few foundries
26
Q&As on specifications
26
Contact & negotiate, Q&As
27
Bid online and negotiate
28
Create purchasing order
A particular foundry
29
Place purchase order
30
Acknowledge P.O.
31
Project management
Project Mgt
31
Project management
32
Supply chain management
32
Supply chain management
33
Release against P.O.
34
Invoice
36
Payment
35
Project wrap-up and summary
Project Wrap-up & Summary
37
38
Feedback
38
Feedback

FIG. 3

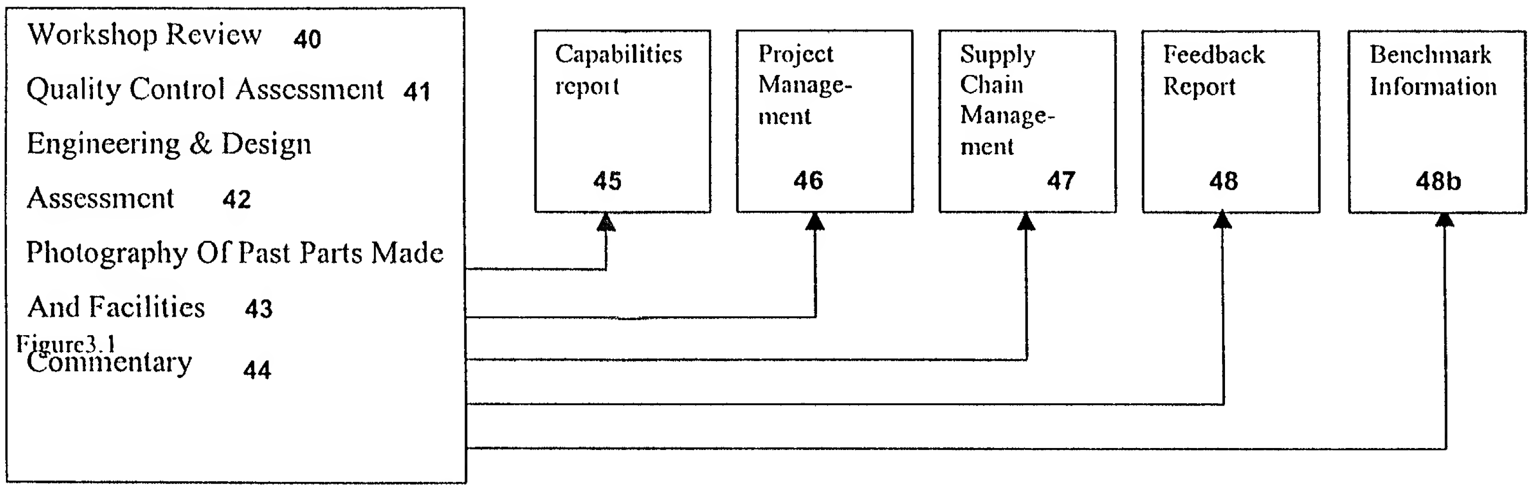

Workshop Review 40
Quality Control Assessment 41
Engineering & Design
Assessment 42
Photography Of Past Parts Made
And Facilities 43
Figure3.1
Commentary 44
Capabilities report 45
Project Management 46
Supply Chain Management 47
Feedback Report 48
Benchmark Information 48b

FIG. 4

Introduction

This is a procedure for the audit of a foundry as the basis for a FoundryFiles™ report for evaluation and assessment of foundry technical capabilities, production capacities, quality control, engineering and design, and management, service and training.

Part I: Technical Capabilities

1) Production Capacity

Workshop size: _____
Casting weight range (ton): _____
Casting size range (mm): _____
Average weekly tonnage: _____
Maximum weekly tonnage: _____
Production capacity used: _____

FIG. 5a

2) Technical Capabilities

Types of melting facilities:

- Electric induction/electric arc cupola/other _____

Design facilities: ☐Yes ☐ No Number of employees _____

Patternmaking facilities ☐ Yes ☐ No Number of employees _____

Machining facilities: ☐Yes ☐ No Number of employees _____

Type of machines:

☐ Conventional/ ☐NC/ ☐CNC/☐ lathes/☐ borers vertical or horizontal/

☐ drills, bench, radial, multi-pindle/☐ other, please specify _____

Is pattern/machining shop directly controlled by foundry? ☐Yes ☐ No

Is above capacity tied to own use/associate/group companies? ☐Yes ☐ No

If so, what is the percentage/tonnage? _____

Coremaking facilities

☐ Oil sand ☐CO2 ☐shell ☐ No-bake, chemical bonded ☐ other _____

Industrial standards used:

☐ ANSI Y14.5M-1982
☐ ISO 8062
☐ ASTM
☐ ASME
☐ AA
☐ EU
☐ Other, please specify

3) **Casting Processes**

FIG. 5b

☐ Conventional molding processes
- ☐ Green sand casting
- ☐ High density molding
- ☐ Flaskless molding
- ☐ Tight Flask molding
- ☐ Skin-Dried and dry sand molding
- ☐ Other, please specify _____

☐ Precision molding and casting processes
- ☐ Permanent molding ("Gravity die casting")
- ☐ Low pressure molding ("Die casting")
- ☐ High pressure molding ("Die casting")
- ☐ Investment casting ("Lost Wax")
- ☐ Ceramic molding ("Shaw process")
- ☐ Hitchiner process ("CLA, CLAS, CLAV")
- ☐ Other, please specify _____

☐ Chemically bonded sand molding processes
- ☐ Shell molding (Organic)
- ☐ Sodium Silicate CO2 Bonded molding (Inorganic)
- ☐ No-Bake molding (Chemically bonded self-setting sand mixtures)(Organic)
- ☐ Other, please specify _____

☐ Special and innovative molding and casting processes
- ☐ Evaporative Pattern Casting (EPC)
- ☐ Vacuum ("V") Process Molding
- ☐ Centrifugal Process Molding
- ☐ "H" Process Molding
- ☐ Lost Foam Molding
- ☐ Other, please specify _____

4) **Casting Materials Used**

☐ Ferrous Metals
- ☐ Gray Iron

☐ Class 20 ☐ Class 30 ☐ Class 40 ☐ Class 50 ☐ Class 60
☐ White Iron Ni-Hard, High Cr.
☐ Alloyed Irons, Ni-Resist
☐ Compacted Graphite Irons
☐ Other, please specify

☐ Ductile Iron
☐ Ferritic (60-40-15, 60-45-12, 60-40-18)
☐ Pearlitic/Ferritic (80-55-06, 80-60-03)
☐ Pearlitic (100-70-03)
☐ Martensitic (120-90-02)
☐ Bainitic (130-100-04)
☐ Other, please specify

FIG. 5c

☐ Malleable Iron

☐ Steel
☐ Carbon and low alloy
☐ Corrosion resistant steel
☐ Heat-resistant steel
☐ Manganese-Wear resistant steel

☐ Ferrous Metals
☐ Brass
☐ Bronze
☐ Nickel-Base Alloys
☐ Zinc Base Alloys
☐ Aluminum Alloys
☐ Sand casting and permanent mold alloys
☐ Die-casting alloys
☐ Aluminum-Magnesium Alloys
☐ Magnesium Alloys

Part II: Workshop Review

Part I requires the auditor to visit the main manufacturing departments of the foundry and make notations covering three main aspects of each: machine types, proof of calibration, and operator procedures (SPS).

- Machine types: determine at least Machine "model" and "maker" from machine label plates. "Capacity" and "year made" information may be supplied by foundry personnel.

Molding machines:

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

FIG. 5d

2) **Flask sizes**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

3) **Sand mixer**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

4) **Molding boxes**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

5) **Mould handling system**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

6) **Sand plant**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

7) **Melting furnace:**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____

Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

8) **Machining equipment**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

FIG. 5e

9) **Tooling machines -- Manual**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

10) **Tooling machines -- CNC**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

11) **Tooling machines -- RP**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

12) **Tooling machines -- Other**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

13) **Post-Finishing Facilities (Report on five machines of foundry's choice)**

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

Machine model:_____Maker_____

Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

FIG. 5f

Machine model:_____Maker_____
Capacity:_____Year made:_____
Calibrated by: _____Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

Part III: Special Capabilities Review

Part II has three distinct parts: assessment of the quality lab (instrumentation) and of the design center (CAD/CAM), and photography of representative output in the form of in-process castings.

(A) Quality Laboratory Assessment

Part A requires the auditor to go the quality laboratory of the foundry and go through the steps indicated in Part I above for the main workshop areas: identify machine types, obtain proof of calibration, and assess operator competence.

(1) **Awards received**

Name of awards _____
Awarded by _____ Date _____

Name of awards _____
Awarded by _____ Date _____

Name of awards _____
Awarded by _____ Date _____

Name of awards _____
Awarded by _____ Date _____

Name of awards _____
Awarded by _____ Date _____

Name of awards _____
Awarded by _____ Date _____

(2) **ISO 9000 certified?**

ISO Series Certified: _____
Audited by: _____ Date: _____

(3) **QS 9000 certified?**

If certified,
Audited by: _____ Date: _____

FIG. 5g

(4) **ISO 14000 certified?**

If certified,
Audited by: _____ Date: _____

(5) **6σ implementation?**

Date from _____
Audited by: _____ Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

(6) **CMM**

Type: _____
Calibrated by: _____ Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

(7) **Digital laser measurement system**

Type: _____
Calibrated by: _____ Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

(8) **Non-destructive testing (X-Ray, etc)**

Type: _____
Calibrated by: _____ Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

(9) **Mechanical properties testing machines**

Type: _____
Calibrated by: _____ Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

(10) **Thermal testing machines**

Type: _____
Calibrated by: _____ Date: _____
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

(11) **Hardness testing machines**

Type:____
Calibrated by: ____________________________ Date: ________
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

FIG. 5h

(12) **Pouring monitoring (electromagnetic treatment)**
Methods: ____
Equipment used: ____________________________
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

(13) **Dimensional accuracy**
Process: _______________ Accuracy _______________ Standards used ________
Calibrated by: ____________________________ Date: ________
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

Process: _______________ Accuracy _______________ Standards used ________
Calibrated by: ____________________________ Date: ________
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

Process: _______________ Accuracy _______________ Standards used ________
Calibrated by: ____________________________ Date: ________
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

Process: _______________ Accuracy _______________ Standards used ________
Calibrated by: ____________________________ Date: ________
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

Process: _______________ Accuracy _______________ Standards used ________
Calibrated by: ____________________________ Date: ________
Operation: ☐very complete knowledge ☐acceptable ☐incomplete understanding

(B) Engineering and Design Center Assessment

Part B is a simple inventory of CAD/CAM/CAE software. It requires the auditor to go to the foundry's engineering and design center, sit at a computer module, and have the operators display the software installed for identification.

Pro/Engineer☐Version:________________________________
No. of licenses ____________________________

CATIA☐Version:________________________________
No. of licenses ____________________________

I-Deas☐Version:________________________________
No. of licenses ____________________________

UG-II☐Version:________________________________
No. of licenses ____________________________

Solidworks ☐Version:_____
No. of licenses _____

Magma: ☐Version:_____
No. of licenses _____

ABAQUS☐Version:_____
No. of licenses _____

Other☐Version:_____
No. of licenses _____

Other☐Version:_____
No. of licenses _____

Other☐Version:_____
No. of licenses _____

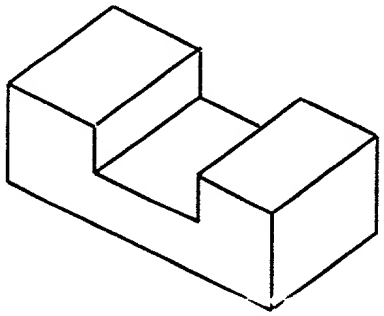
FIG. 5i

(C) Photography of in-process castings

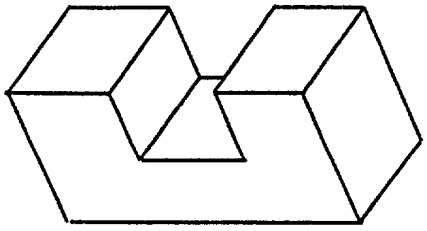
Part C requires the auditor to take a series of photographs of representative output of the foundry. The fundamental requirement is that all pieces photographed should be taken from work in process -- NOT from finished goods inventory or showroom. [Note: The foundry will have a separate option to display goods of their choice from their showroom in connection with the castingtrade.com site.]

The ideal is to photograph ten different pieces. Some of the photographs should be taken after the final finishing stage. It would be good to take some at the just-cast stage, as well (and ideally covering several different stages of the same piece).

The format of the photograph should be at an isometric or trimetric view:



Isometric View



Trimetric View

(D) Management, Service and Training Program

What kind of management systems used now?

☐ JIT ☐ ERP ☐ CIMS ☐ FMS ☐ TQM☐ Other, please specify _____

Advice for casting pattern, process, materials and design ? ☐ Yes ☐ No

Own delivery facilities? ☐ Yes ☐ No
If, yes, what's the transportation capacity? _____

Education/Training programs for continuous improvements? ☐ Yes ☐ No
If yes, list the program title(s):

_____
_____
_____

FIG. 5j

Part IV: Commentary

Space is provided for other comments and observations by the auditor. This time may also be used to make sure all other parts of the report form are complete, fill in any missing information, and add any additional comments.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Cast Metal Parts

Project Management -- Key Steps

(To be included in project management software.)

Tooling

- Drawing interpretation
- 3D modeling
- Master pattern fabrication
- Coremaking
- Mold making

Parts Casting

- Mold layout
- Metal melting
- Testing pouring
- Process control
- First article part
- Volume production

Finishing

- Sprue removal
- Snapping, chipping & cleaning
- Tumbling, pickling & welding
- Heat treatment

Inspection

- Visual inspection
- Dimensional inspection
- Non-destructive testing

Shipping

- Shipment schedule
- Shipment implementation
- Clear customs (if applicable)
- Shipment tracking
- Shipment received

FIG. 6

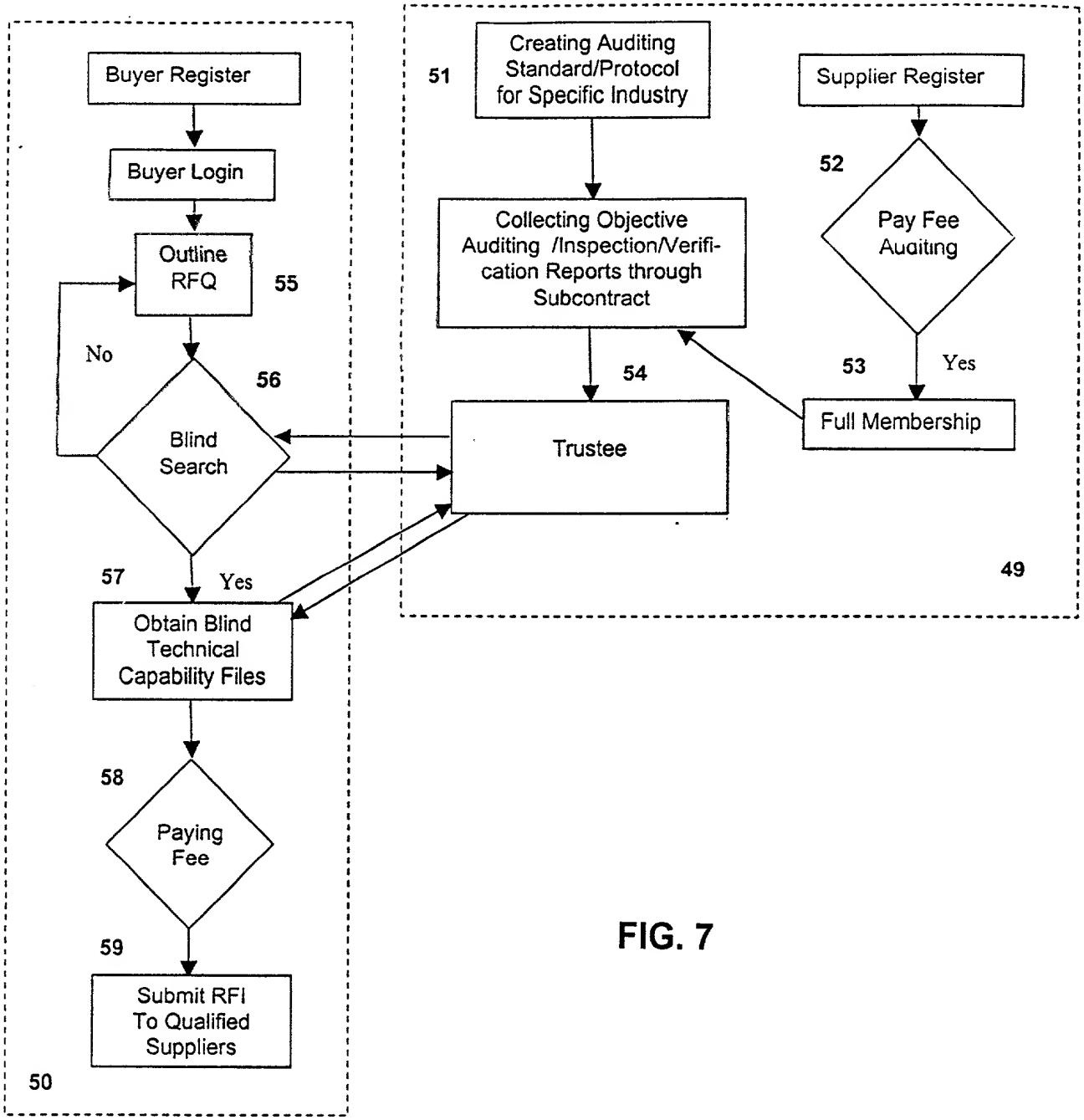

Buyer Register
Buyer Login
Outline RFQ
55
No
56
Blind Search
57
Yes
Obtain Blind Technical Capability Files
58
Paying Fee
59
Submit RFI To Qualified Suppliers
50
51
Creating Auditing Standard/Protocol for Specific Industry
Collecting Objective Auditing /Inspection/Verification Reports through Subcontract
54
Trustee
Supplier Register
52
Pay Fee Auditing
53
Yes
Full Membership
49

FIG. 7